

GREATER TROCHANTERIC RE-ATTACHMENT DEVICE

BACKGROUND OF THE INVENTION

[0001] This invention relates to a greater trochanter re-attachment device for use in transfemoral revision surgery. In the surgical technique which involves transfemoral osteotomy the femur is exposed along a proximal/distal line, the soft tissue (skin, muscle) being folded back on each side to expose the bone. The proximal end of the femur is now opened as a "window" and a femoral prosthesis is inserted into the bone canal. Such a surgery is discussed in co-pending U.S. Application Nos. 10/011,047 and 10/008,336 and assigned to the assignee of the present invention, the teachings of which are incorporated herein by reference.

[0002] As used herein, when referring to bones or other parts of the body, the term "proximal" means closer to the heart and the term "distal" means more distant from the heart. The term "inferior" means toward the feet and the term "superior" means towards the head. The term "anterior" means towards the front part of the body or the face and the term "posterior" means towards the back of the body. The term "medial" means toward the midline of the body and the term "lateral" means away from the midline of the body.

[0003] When this surgery is performed in the transfemoral approach the lengthwise dissection of the bone leaves the greater trochanter in place on a displaced portion of the bone. When the bone is closed again and the greater trochanter is in its correct position there is a loading on the closed bone where it has previously been opened and in known techniques the portions of the bone are wired together thus re-attaching the greater trochanter to the stem. This osteosynthesis occurs at the end of the operation. This is a critical aspect of the surgery because if the flap of bone containing the greater trochanter (the greater trochanter window) is not well attached the stresses on the stem will

not be well distributed and a peak of stress can effect the distal tip of the stem leading to a cortex reaction, or a breakage of the stem, or of the screws if the stem is distally fixed.

SUMMARY OF THE INVENTION

[0004] The present invention is intended to provide a trochanter re-attachment device and a femoral prosthesis to use the device in combination therewith which will simplify the osteosynthesis and shorten the time required to perform it.

[0005] According to the present invention a greater trochanter re-attachment device, such as a flexible bracket, for use in transfemoral revision surgery comprises an attachment device, such as a threaded screw adapted for securing to a femoral prosthesis with which it is to be used. The attachment device carries an adjustable securing element adapted to extend from the attachment device and pass around the flap of a bone segment containing the greater trochanter and which, when secured in position, holds the greater trochanter in position in relation to the femoral prosthesis.

[0006] The attachment device may comprise a threaded screw adapted for insertion in a threaded bore or socket in the shoulder of the femoral prosthesis with which it is to be used. The adjustable securing element is preferably in the form of an elongated flexible tie, for example a wire, such as a cerclage wire, strap or ribbon, and two or more ties can be provided if required.

[0007] In one preferred embodiment, the threaded screw is provided with openings to receive the elongated flexible tie. In another embodiment, the adjustable securing element is carried on one free end of a bracket which extends over the proximal external surface of the greater trochanter and the other end of which carries the attachment device. With this construction the bracket can have two sections which extend substantially normal to each other, the bracket first section

having a curved re-entrant shape to extend around and over the proximal end of the greater trochanter and having a bifurcated free end provided with the adjustable securing element, and the second arm carries the attachment device. The bifurcated free ends of the first arm can each include a guide or guides to locate the adjustable securing element.

[0008] The bracket can be made from any convenient material, for example, a synthetic plastics material or metal which is compatible with the requirements of the human body.

[0009] The invention also includes a device as set forth above in combination with a femoral prosthesis. Thus, the femoral prosthesis can be provided with a screw threaded socket in its shoulder which is adapted to receive a stem impactor or extractor, or a targeting device, and which also receives the attachment device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention can be performed in various ways but two embodiments and a description of a previously known method of attaching the greater trochanter during transfemoral revision surgery will now be described by way of example and with reference to the accompanying drawings in which:

[0011] FIG. 1 is a pictorial view showing a known method of attaching the part of the bone of the femur which carries the greater trochanter in the opened (window) position and ready for re-attachment after transfemoral revision surgery;

[0012] FIG. 2 is a side elevation view of a first embodiment of the greater trochanter re-attachment device according to the present invention;

[0013] FIG. 3 is plan view of the device shown in FIG. 2;

[0014] FIG. 4 is an end view of the device shown in FIGS. 2 and 3;

[0015] FIG. 5 is a pictorial view of a femur with an installed femoral prosthesis after transfemoral revision

surgery and showing the re-attachment device as shown in FIGS. 2, 3 and 4 in place;

[0016] FIG. 6 is a pictorial plan view of the greater trochanter shown in FIG. 5 with the re-attachment device in place;

[0017] FIG. 7 is a top isometric view of a second embodiment according to the present invention;

[0018] FIG. 8 is a bottom isometric view of that second embodiment similar to that shown in FIG. 7;

[0019] FIG. 9 is a pictorial side view of a third embodiment of the present invention;

[0020] FIG. 10 is a pictorial side view of a fourth embodiment of the invention on a femur;

[0021] FIG. 11 is a pictorial front view of the assembly shown in FIG. 10; and

[0022] FIG. 12 is a pictorial top view of the assembly shown in FIGS. 10 and 11.

DETAILED DESCRIPTION

[0023] Referring to FIG. 1 there is shown a known standard technique for closing the greater trochanter window after the installation of a femoral prosthesis. Shaft 1 of the femur has been resected with three cuts along the axis of the bone and a distal transverse cut so that it can be opened, the portion of the proximal femur bone containing the greater trochanter being indicated by reference numeral 2. The femoral prosthesis 3 has been inserted into one part 4 of the bone canal and another part of the canal which is within portion 2 is indicated by reference numeral 5. The third central portion 15 of the bone is also provided which assists when the "window" is closed. Reference numeral 6 indicates the muscles which are attached to the greater trochanter 7.

[0024] Femoral prosthesis 3 has a shoulder 8, a neck 9 and a screw threaded bore 10 which is provided in the shoulder 8 to receive a stem impactor or extractor, or a targeting

device. The distal end of the prosthesis is located in the bone canal 4 by means of screws 11.

[0025] During the surgery holes 12, 13 are drilled through the bone to accept binding wires 14 and when the "window" is closed these binding wires are pulled tight and clamped together.

[0026] Extra tie wires, not shown in FIG. 1 but shown in FIG. 5 are also usually employed to hold the bone together. It will be appreciated that there are difficulties drilling holes 12, 13 in threading the wires through them and then substantially clamping them.

[0027] The preferred greater trochanter re-attachment device for use in transfemoral revision surgery according to the present invention is shown in FIGS. 2, 3 and 4 and comprises a bracket 20 which has a first section 21 which is substantially normal to a second section 22. The first section 21 has a curved re-entrant shaped section 100 to extend around and over the proximal end of a greater trochanter. In the preferred embodiment, the free end of section 21 is bifurcated to form a pair of arms, as is most clearly shown in FIGS. 3 and 5, and has adjustable securing element 23 which extend around the external surface of the bone substantially perpendicular to its proximal distal length. In the preferred embodiment, the securing element is in the form of an elongated flexible tie or band 24 which can be, for example, a wire, strap or ribbon. In the drawings, it is shown in ribbon form with an end connector 25. The flexible connector extends through a guide in the bifurcated ends of section 21. In the arrangement shown in the drawings the guides are in the form of rectangular apertures 26 but they could be in the form of clips or grooves on the outer surface of the bifurcated arm or any other convenient construction. As shown in FIGS. 2, 3 and 4 a series of spaced apertures 26 are provided and band 24 can be used in any one of them. If appropriate, one or more further bands,

indicated by broken lines 24a can be included. If only one tie is used, or two close together, the unneeded bifurcated arms 2 can be removed.

[0028] The second section 22 is provided with an opening 27 to receive an attachment element preferably in the form of a threaded screw 30 for securing to the femoral prosthesis (not shown in FIGS. 2, 3 or 4 but indicated in FIG. 5). Screw 30 thus supports the adjustable securing band 24 via bracket 20.

[0029] FIG. 5 shows how the device shown in FIGS. 2, 3 and 4 is employed to re-attach the greater trochanter after transfemoral revision surgery.

[0030] Bracket 20 is first placed in position on greater trochanter 7, the bifurcated arms of section 21 enabling the surgeon to pass them through the muscles 6 until the bracket is in position shown in FIG. 5. In this position the opening 27 in the second section 22 is aligned with threaded bore 10 in the prosthesis and a screw 30 is used as an attachment element to secure bracket 20 to shoulder 8 of prosthesis 3.

[0031] Flexible tie 24 can now be passed through the apertures 26, assembled around the bone as shown in FIG. 5 and tightened so that it acts as securing device extending around the external surface of the bone substantially normal to its proximal/distal length. If desired the flexible band 24 could be pre-assembled on the end of section 21 prior to connecting the bracket to shoulder 8 of prosthesis 3.

[0032] In the assembly shown in FIGS. 5 and 6, a single band 24 is used in a single aperture 26 in the bifurcated arms of bracket section 21 but if required a bracket having a number of apertures 26 could be employed with two or more ties or bands 24a.

[0033] Additional external wires 29 can also be provided to hold portion 2, part 4 and central portion 15 of the bone in place. It will be appreciated that the present invention

provides a simple device for rigidly holding the greater trochanter in place after the femoral prosthesis has been inserted.

[0034] FIGS. 1 and 5 show head 31 of the prosthesis in place in an acetabular cup 32. The technique of being able to place the head 31 in position during transfemoral revision surgery is one of the advantages of the present invention.

[0035] FIGS. 7 and 8 show an alternative construction for bracket 20 and the same reference numerals are used to indicate similar parts to those shown in FIGS. 2 to 4. With this construction, the bracket is indicated by reference numeral 33 and is made from a resilient material, for example a resilient or bendable metal strip. The bracket is initially formed with a single curve 34 which replaces the curved re-entrant shape shown in FIGS. 2 to 4. This end of the bracket has an opening 35 to receive the threaded screw 30 and the part of the bracket adjacent opening 35 is again curved and passed with troughs 36 to reinforce it.

[0036] The first section 37 is again bifurcated and is split and dimpled on each side to provide a series of transversely extending openings 38 in each of the bifurcated arms 39.

[0037] In the preferred embodiment, the bracket is formed by a single pressing or stamping which provides the troughs 36 and the slits to allow the dimples to be produced.

[0038] It will be seen from the drawing that section 37 of the bracket shown in FIGS. 7 and 8 is somewhat longer than section 21 shown in FIGS. 2, 3 and 4. In use, the bracket shown in FIGS. 7 and 8 is first attached to the prosthesis by the threaded screw 30. In this position, section 37 will extend upwardly away from the bone at the greater trochanter 7. The surgeon can now however bend the bracket to provide a close and accurate fit due to the bracket's resilience. An elongated flexible tie 24 as shown in FIGS. 2, 3 and 4, can now be located through the appropriate

openings 38 to hold the bracket in place on the greater trochanter 7. If desired a further elongated flexible tie 24a can be used as described with regard to FIGS. 2, 3 and 4.

[0039] FIGS. 9 and 10, 11 and 12 shown other embodiments of a greater trochanter re-attachment device for use in transfemoral revision surgery according to the invention. The same reference numerals are used to indicate similar parts to those shown in FIGS. 1 to 6.

[0040] In the embodiment of FIG. 9, the attachment device is provided by a threaded screw 40 which has a cylindrical head 41. A series of rectangular openings 42 extend diametrically across the head. The adjustable securing means is again provided by an elongated tie 43 having a connector 44. Although a flexible tie is shown a wire or similar element could be employed.

[0041] FIGS. 10, 11 and 12 show a device similar to that shown in FIG. 9 but employing a flexible wire which can pass through circular openings 45 in head 41 of the screw. The device is employed to re-attach the greater trochanter 2 after transfemoral revision surgery but in order to clarify the drawings various integers shown in FIGS. 1 and 5 are omitted. Screw 40 is located in the screw threaded socket 10 in the prosthesis and the flexible tie 43 is first threaded through a sleeve 46 and then through one of the openings 45 with the connector 44 to one side. The tie is now passed around the greater trochanter 2 and back through the sleeve 46, around the end of the central portion 15 of the bone and back through the connector 44. The tie is then pulled tight so that the greater trochanter is held in position shown in FIG. 8 so that it acts as a securing means extending around the external surface of the greater trochanter 2 and the bone portion 15 to hold them in position, the free end protruding from the connector 44 is then removed.

[0042] Alternative wrapping arrangements for tie 43 can be used as desired by the surgeon provided that the greater trochanter and portion of the bone 15 are held tightly in position.

[0043] It will be appreciate that with this arrangement the device is simple to operate but can provide the necessary pressure.

[0044] Additional external wires 29 can be used to hold portion 2, part 4 and central portion 15 of the bone in place as described with regard to FIGS. 1 to 8 and the band 43 has the ability of being able to pass through muscles 6 without disadvantage.

[0045] Although the invention herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that other arrangements may be devised without departing from the spirit and scope of the present invention as defined by the appended claims.